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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Un-Gyu Paik

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EXAMINER

HOBAN, MATTHEW E

ART UNIT

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4116

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/550,804	Applicant(s) PAIK ET AL.	
	Examiner MATTHEW E. HOBAN	Art Unit 4116	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 12-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 12-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/22/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION^[el1]

Status

Claims 1-3 and 12-23 are pending and presented for examination

Claims 4-11 were cancelled previously by applicant in response to an election of species requirement.

Election/Restrictions

1. The application was previously subject to an election of species among two distinct species represented in various claims. In response to this requirement, applicant drafted new claims 22 and 23, which encompass the same matter as now cancelled claims 4-11. This response to the requirement made without traverse is deemed to be proper and the election is thus made final.

Information Disclosure Statement

2. The information disclosure statement filed 9/22/2005 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. The IDS refers to several documents, which were not submitted. These documents were not considered(as struck in PTO-1449); however, all other documents, which were submitted and acknowledged on the IDS were considered in the examination process.

Claim Objections

3. Claim 1 is objected to because of the following informalities: Grammatically the language of the third line of claim 1 is erroneous. The word “created” or “manufactured” need to be included between the words “groups” and “by”. Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 2, 12, 13, and 15-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Akahori et al in European Patent No. 1,148,538 A1.

6. **The instant claims 1 and 2** are drawn to a CMP abrasive comprising a ceria slurry and a chemical additive having two or more functional groups which is created by mixing and synthesizing a polymeric molecule and a monomer. The ceria slurry of the above abrasive comprises ceria powder, water, and a negative-ion—based polymeric compound and conforms to a Newtonian viscosity behavior.

7. Akahori et al teach a CMP abrasive comprising a cerium oxide slurry containing cerium oxide particles, a dispersant and water, as well as a liquid additive containing a dispersant and water (See page 3, lines 10 to 14). The abrasive has several embodiments which are exemplified in Table 1-1. In this table it can be seen that the

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cerium oxide slurry and liquid additive are present, where the liquid additive comprises a dispersant which is a copolymer of an acrylic acid polymer, which is synthesized to include methyl acrylate as a monomer. This copolymer has two or more functional groups and is then mixed with the cerium slurry to create the final CMP abrasive. The cerium slurry of Akahori is prepared by several different means, which are exemplified in preparation methods 3, 4, and 5 on page 7. In all of these embodiments an acrylic acid copolymer was synthesized and used as the dispersant, where the acrylic acid copolymer is an anionic polymeric compound. Furthermore, in these methods the slurries are diluted to 2 wt% ceria, which means that based on the initial concentration of ceria, the wt% of the polyacrylic acid copolymer would be .048 wt%. The diluting solvent is water. Since this solution is over 97% water it would behave as a Newtonian solution and display Newtonian viscosity behavior. The product as described above totally anticipates claims 1 and 2 of the instant application.

8. **The instant claims 12, 13, and 15-19** are drawn to a method of manufacturing a CMP abrasive. This is accomplished by providing a ceria slurry, manufacturing a chemical additive having two or more functional groups by mixing and synthesizing a polymeric molecule and a monomer in a reactor, and finally mixing said slurry and said chemical additive. The ceria slurry of the above mixture also has several steps, which are used in the process of its manufacture, including manufacturing ceria by solid-phase synthesis, mixing the ceria with water, milling in a high energy attrition mill, dispersing the milled resultant with a high pressure dispersion apparatus, and dispersion stabilizing said dispersed resultant by adding a negative-ion based polymeric compound, where

the negative ion based polymeric compound is present in an amount of from .0001 to 10 wt%. Following dispersion, the ceria slurry is finally filtered to remove and large particles with a filter. The step of manufacturing the chemical additive also has a few more steps and limitations. After its synthesis, further solvent is added to the chemical additive until the chemical additive is .03 to 10 wt% of the solution. Furthermore, the chemical additive should have a molecular weight of 2,000 to 1,000,000 amu.

9. Akahori et al teach a method of manufacturing a CMP abrasive in several steps. The process of making an abrasive, which is of particular interest is outlined in Preparations 1, 3 and the final product Example 1. The process begins by creating the ceria powder. This is done by burning cerium carbonate in a platinum vessel at a temperature of 700 Celsius, which is a solid phase process of creating cerium oxide (Relevant to Claim 13{step a}). The fabricated cerium oxide powder is then mixed with deionized water and the particle size is reduced through a horizontal wet ultrafine dispersing-pulverizer. A pulverizer is the functional equivalent of an attrition mill as both decrease the particle size of powders in an aqueous environment. A pulverizer does however reduce particle size through attrition, which is defined as physical wear (Relevant to Claim 13{steps b and c}).

10. Akahori then creates a slurry with the ceria by a process outlined in Preparation 3. In this step 125g of the ceria particles of the above preparation are mixed with 3g of a 40-wt% aqueous solution of an ammonium salt of a polyacrylic acid copolymer as well as 2372g of water. The polyacrylic acid copolymer is a negative ion based polymeric compound and comprises approximately .0012 wt% of the slurry

(Relevant to claims 13{e} and 15). The mixture is then dispersed using an ultrasonic mixer with stirring. The use of an ultrasonic mixer in place of a high pressure dispersion apparatus is a substitution that is not novel and well within the capabilities of one of ordinary skill in the art. Both pieces of equipment perform the same purpose of dispersing a powder in an aqueous solution with the same ultimate result (Relevant to claim 13{d}). Furthermore, the fact that Akahori adds negative ion based polymeric compound before dispersion in a high pressure dispersion apparatus does not offer patentable distinction to the instant claims. The order in which these steps were performed yields the same well dispersed solution and their order is interchangeable. Following dispersion, the slurry is filtered with a .8 micron filter.

11. Akahori then creates a CMP abrasive in Example 1. This is accomplished by using the ceria slurry above and a liquid additive (chemical additive). The chemical additive is a premanufactured polyacrylic acid polymer synthesized with methyl acrylate monomers (this has two or more functional groups) (Relevant to Claim 12 and 15). Although this chemical seems to not be made by Akahori, it was synthesized in a reactor by someone none the less. In table 1 it can be seen that this chemical additive is diluted with water to a concentration of 1% and has a molecular weight of 10,000 (Relevant to claim 17-19). The ceria slurry and liquid additive are added together in equal portions of 500g to create the final CMP abrasive (Relevant to Claim 12).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

14. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

15. **Claims 3 and 13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Akahori in EP 1148538 in view of Kido et al in EP 1,061,111.

16. Please review the above 102 rejection to discern the breadth of the instant claims as well as the teaching of Akahori in relation to the claims.

17. The difference between the instant claims 3 and 13 and the teachings of Akahori is the fact that Akahori uses a poly acrylic acid copolymer as a negative ion based polymer dispersant in the ceria slurry, while the instant claims use several other species of polymer, not inclusive of poly acrylic acid.

18. This difference is resolved by Kido who teaches the use of polymethacrylic acid in the ceria slurry, where the methacrylic acid performs the same function as the polyacrylic acid of Akahori. This can be seen in Example 10 of Kido, and the results found in Table 2. The results from this experiment show that polymethacrylic has a selection ratio relatively the same as acrylic acid, which was used by Akahori. Furthermore, methacrylic acid has a 4% faster polishing rate. This means that methacrylic acid can perform at the same quality as acrylic acid, but at a slightly faster rate. This alone gives good motivation to use methacrylic acid in the invention of Akahori. This substitution could be done in light of the fact that these two chemicals are shown to be functional equivalents by Kido and one of ordinary skill in the art would have been able to recognize this and combine these two teachings. This teaching could be incorporated into both the product as in claim 3, and also the process of manufacturing in claim 13.

19. **Claims 20-24** rejected under 35 U.S.C. 103(a) as being unpatentable over Akahori et al in EP 1148538.

20. Please review the above 102 rejection to discern the breadth of the instant claims as well as the teaching of Akahori in relation to the claims.

21. The difference between the instant claims 20-24 and the explicit examples as taught by Akahori is the fact that Akahori does not teach the exact chemical additive as recited by claims 20 and 22. This chemical additive of the instant claims includes a compound that is a polymeric acrylic acid or alkyl methacrylate synthesized and reacted with a monomer of acrylamide, methacrylamide, ethyl-methacrylamide, vinylpyridine, and vinylpyrrolidone. The chemical additive containing this compound is then added to the ceria slurry at a ratio of 1:1.

22. The difference between Akahori and the instant claims is actually resolved by the rest of Akahori's disclosure, especially at page 4, paragraph 20. Akahori states that several different polymer dispersants are suitable for use in the invention mentioning that "copolymers of an unsaturated carboxylic acid, such as **acrylic acid**, methacrylic acid, or maleic acid, with a copolymerizable monomer, for example an alkyl acrylate, such as **methyl acrylate** or **ethyl acrylate**, a hydroxyalkyl acrylate, such as hydroxyethyl acrylate, an alkyl methacrylate, such as methyl methacrylate or **ethyl methacrylate**, a hydroxyalkyl methacrylate such as hydroxyethyl methacrylate vinyl acetate or vinyl alcohol and ammonium salts or **amine** salts of the copolymers.

[emphasis added]" Specifically a chemical additive having a polymeric group being PAA and the monomer being acrylamide or ethyl-methacrylamide falls under the group as disclosed by Akahori. Akahori's disclosure teaches that a large group of simple carboxylic acid polymers, complexed with acrylamides and similar compounds are useful in the invention. This renders any other use of a simple well known compound of this nature to be an obvious variant to try based on Akahori's disclosure. More

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specifically a PAA polymer complexed with ethyl-methacrylamide or acrylamide would be even more obvious based on the fact that this combination was explicitly mentioned. Furthermore, the ratio at which the chemical additive and the ceria slurry are mixed is integral in all of Akahiro's explicit examples, where 500g of the ceria slurry is mixed with 500g of the chemical additive. The optimal mixture ratio of 1:1 Between these two elements is well known. Therefore, upon reading Akahori's disclosure it would have been obvious to one of ordinary skill in the art to experiment with and try different polymers based on acrylate polymers and acrylamide monomers. Akahori states that this class of material is functionally equivalent to those used in his explicit examples and one of ordinary skill in the art would have recognized this and would have had a reasonable expectation of success.

Conclusion

Claims 1-3 and 12-23 are rejected

Claims 4-11 are cancelled.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW E. HOBAN whose telephone number is (571)270-3585. The examiner can normally be reached on Monday - Friday from 7:30 AM to 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on (571) 272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MEH

/Vickie Kim/
Supervisory Patent Examiner, Art Unit 4116